

SUSTAINABLE CONCEPT DESIGN BRIEF

NORTHAMPTON POLICE DEPARTMENT

April 2008

Prepared for

Caolo & Bieniek Associates Inc.



Prepared by

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1. INTRODUCTION

LEED® (Leadership in Energy and Environmental Design) is the most widely used and recognized green building rating system. LEED is a point-based system with four levels of certification (Certified, Silver, Gold and Platinum) that are awarded based on the number of points earned. While LEED has no financial incentives attached to it, a LEED designation lends a higher profile to a building and displays the owner's commitment to minimize environmental impact.

Consistent with the *Sustainable Northampton Comprehensive Plan*, an important goal for this project is to design and construct the new police facility to meet LEED certification standards. In order to be classified as a LEED building, the new facility must achieve at least a "Certified" level of certification under the US Green Building Council's *New Construction & Major Renovation Version 2.2* green building rating system. To attain this level, at minimum of 26 out of a possible 69 points must be achieved, in addition to satisfying 7 prerequisites. These points and prerequisites are divided into six categories including Sustainable Sites, Water Efficiency, Energy Efficiency, Materials & Resources, Indoor Environmental Quality and Innovation & Design.

During the concept design process, the design team, led by Caolo & Bieniek Associates Inc., discussed all prerequisites and potential LEED credits. These discussions, facilitated by Enermodal Engineering Ltd. as the LEED consultant, allowed team members to provide input on the costs and merits of each credit. As a result, the design team estimates that it is feasible to pursue 39 points (plus 9 points pending) throughout the detailed design and construction phases of this project. This would allow the building to achieve a LEED "Gold" Rating (39 to 51 points). A summary of the prerequisites and credits targeted for this facility is provided in Appendix A.

The remainder of this document summarizes the preliminary design details that have been discussed to date, as they relate to the sustainable component of this project.

2. SUSTAINABLE SITES

The built environment has an enormous impact on local communities and ecosystems. Through careful attention to green design issues and construction practices, the design team has committed to make meaningful and long-lasting improvements to the new Northampton Police Department that will enhance performance and set a standard for future municipal developments. These improvements include:

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- Implementing and enforcing a rigorous Erosion and Sedimentation Control Plan at all times during construction to minimize the loss of soil from overland flow, concentrated flow, wind and vehicle movement
- Providing bicycle racks and easy access to the shower and changing areas to encourage staff and visitors to use fossil fuel-free transportation
- Adding designated carpool spaces adjacent to the building and implementing a comprehensive carpool plan to promote shared vehicle use
- Minimizing the number of parking spaces provided for the facility to reduce site development and encourage alternative transportation (bicycles & transit)
- Treating stormwater to minimize the amount of suspended solids leaving the site and to protect downstream waterways from potential contamination
- Collecting rainwater incident on the roof for indoor water use and to decrease stormwater runoff from the site
- Placing 50% of parking spaces provided onsite under cover (i.e. parking garage) to minimize heat island effect
- Providing an exterior lighting design that reduces lighting power densities, and therefore electricity use, through good design practice and careful selection of light fixtures
- Designing site lighting to minimize light pollution into the night sky and onto neighboring properties

Other improvements that have been discussed and that should be revisited during detailed design include:

- Reducing the volume of stormwater run-off from the site using onsite storage or infiltration
- Using a highly reflective roof surface to minimize heat island effect

3. WATER EFFICIENCY

Buildings use significant quantities of potable water for indoor occupant use. Without sacrificing functionality, the design team will incorporate several water saving features to help protect our precious water resources. These features include:

- Collecting rainwater from the roof using a cistern to offset the municipal potable water demand required for toilet flushing

- Installing water conserving fixtures, including dual flush toilets, half-flow urinals, low-flow lavatory faucets and low-flow showerheads to reduce potable water use

By implementing these features the building is expected to achieve over 40% potable water savings for indoor use compared to a similar building using a “conventional” design approach.

4. ENERGY AND ATMOSPHERE

The energy consumed by a building is a major component of their environmental impact. Improving the energy performance of the new police facility will lower operating costs, reduce pollution generated by power plants and relieve the strain on regional power infrastructure. Through the use of energy models it is estimated that this facility can be designed to achieve an energy cost savings of 33% compared to a reference building designed to meet the requirements of ASHRAE/IESNA Standard 90.1-2004 (refer to analysis in Appendix B). This is projected to save over \$20,000 per year in operating costs. To achieve this target the design team proposes to implement the following energy saving measures:

- **Efficient Lighting Design:** Energy efficient lighting will be used throughout the facility and installed lighting power will be lower than that permitted by ASHRAE/IESNA Standard 90.1-2004. The lighting in offices, administration areas, conference/meeting rooms, washrooms, utility rooms and storage areas will be controlled by occupancy sensors. Regularly occupied perimeter areas will be equipped with daylight sensors for daylight harvesting if access to daylight is available.
- **Improved Building Envelope:** The building will use increased wall and roof insulation to provide minimum thermal resistance values of R17 and R20 respectively. Windows will be double glazed and equipped with a soft low-e coating on surface 2, an argon filled inter-space, warm edge spacers and thermally broken frames.
- **Efficient Mechanical Design:** The mechanical design will incorporate many energy saving measures including heat recovery, “free-cooling” and efficient equipment (condensing boilers, variable-speed pumps, high-efficiency chiller, condensing hot water heater, etc.). All refrigerant-based equipment serving this building will use refrigerants which have significantly reduced ozone depletion and global warming potential.

To ensure that the mechanical and electrical systems of this building operate and perform as intended, a commissioning agent will verify equipment installation, test functional performance, and prepare a commissioning report.

The design team also proposes to install metering equipment on mechanical and electrical systems to monitor energy consumption. Using the data collected from these meters, the actual energy consumption of building will be compared to a calibrated energy simulation. By making this comparison, maintenance staff can identify and address any equipment or systems that may not be operating as intended.

5. MATERIALS AND RESOURCES

Selecting building materials is an important aspect of green building design. The extraction, processing, transportation and ecological impacts of eventual disposal can have a major impact on the environment. To minimize the environmental “footprint” associated with building materials, the design team will specify products that contain a high recycled content and that are manufactured locally. The team will also give preference to wood products that are certified by the Forest Stewardship Council (FSC).

An aggressive Construction Waste Management Program will be implemented to recycle waste materials instead of sending them to landfill. Recycling bins for land clearing debris, steel, concrete, asphalt, wood, drywall, plastic and cardboard will be provided to send these materials to local recycling facilities. Domestic waste (e.g. food and beverage containers) generated during construction will also be recycled using a standard blue-box program. The building itself will incorporate an area dedicated to the storage and separation of recyclables during operation.

6. INDOOR ENVIRONMENTAL QUALITY

The indoor environment and air quality can have a drastic impact on occupant satisfaction, productivity and well-being. As such, the design team has elected to incorporate several design features and implement several construction measures to ensure that the best possible indoor environment is created for both construction workers and future building occupants. The features and measures include:

- Designing the amount of outdoor air provided for occupants to meet the requirements of ASHRAE 62-2004
- Incorporating carbon dioxide control in mechanical systems to control the amount of outdoor air provided to a space

- Implementing an indoor air quality plan throughout construction to minimize the impact of pollutants on workers and the absorption of pollutants by materials and equipment that could potentially affect the health of future occupants
- Specifying paints, coatings, adhesives and sealants with low volatile organic compound (VOC) contents as defined by South Coast Air Quality Management District (SCAQMD) rules 1113 & 1167 and Green Seal Standards GS-03, GS-11 and GS-36.
- Specifying carpet that meets or exceeds the Carpet and Rug Institute's (CRI) Green Label Plus requirements.
- Providing occupants with a high degree of controllability by incorporating operable windows and various lighting controls including manual switches, occupancy sensors and daylight sensors
- Providing a high degree of thermal comfort for occupants by designing the mechanical system to meet ASHRAE Standard 55-2004
- Maximizing daylight penetration into interior areas
- Maximizing the amount of interior area provided with a view to the exterior

7. INNOVATION & DESIGN PROCESS

Up to four additional LEED® points can be earned by implementing innovative strategies above and beyond the scope of the LEED® rating system. The design team proposes to obtain several of these points by exploring such strategies as:

- Reducing water use beyond the exemplary performance threshold of 40% savings by installing a rainwater collection cistern for toilet flushing
- Implementing a Green Housekeeping Program using phosphorus-free, non toxic, environmentally friendly cleaning products
- Implementing a comprehensive green building education program consisting of signage, a case study and an interactive kiosk to educate employees and visitors about the green benefits of the building and to create a positive public image

8. NEXT STEPS

After the concept design has been approved and the project moves into the detailed design phase, our next task will be to provide detailed design support. We will work

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with the design team to provide assistance in implementing the energy efficiency and green measures discussed to date. As a part of this work, we will hold a finishes and fit-up workshop to discuss the various green options available for building materials. We will provide product names, suppliers and specifications as required. In addition, we will review the progress drawings and specifications at ~75% and ~100% document completion to verify the design meets the LEED and energy targets established for the project.

This document should be viewed as a progress report and not a final comment on the design. We look forward to working with you and the rest of the design team to achieve the sustainability goals for this building.

Yours truly,

A handwritten signature in black ink, appearing to read 'Gregory Leskien', with a stylized, flowing script.

Per Gregory Leskien

APPENDIX A:
LEED® SCORECARD FOR NORTHAMPTON
POLICE DEPARTMENT

Targeted	Pending	Decision Req'd	Not Pursued	LEED® Scorecard for Northampton Police Department			
39	9	3	18	Certified: 26 to 32 points Silver: 33 to 38 points Gold: 39 to 51 points Platinum: 52 or more points			

8	2	0	4	Sustainable Sites
■				SSp1 Construction Activity Pollution Prevention: Create and implement an erosion & sedimentation control (ESC) plan that conforms to the requirements of the 2003 EPA Construction General Permit, or local standards, whichever is more stringent.
1				SSc1 Site Selection: Site must not be: prime farmland, previously undeveloped whose elevation is lower than 5 ft. above the 100 yr. flood, habitat for threatened or endangered species, within 100 ft. of any wetlands, previously undeveloped land that is within 50 ft. of a water body, or public parkland.
1				SSc2 Development Density: Site must be previously developed and in a community with a minimum development density of 60,000 ft ² /acre OR be previously developed and within 1/2 mile of a residential neighbourhood with an average density of 10 units per acre and within 1/2 mile of at least 10 basic services and have pedestrian access between the building and the services.
			1	SSc3 Redevelopment of Contaminated Sites: Develop on a site documented as contaminated (by means of ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program) OR on a site defined as a brownfield by a local, state or federal government agency.
1				SSc4.1 Public Transportation Access: Buildings must be located within 1/4 mile of 1 or more stops for 2 or more public or campus bus lines OR within 1/2 mile of an existing, or planned and funded, commuter rail, light rail or subway station.
1				SSc4.2 Bicycle Storage & Changing Rooms: Provide secure bicycle racks and/or storage (within 200 yards of a building entrance) for 5% or more of all building users (measured at peak periods), AND, provide shower and changing facilities in the building, or within 200 yards of a building entrance, for 0.5% of Full-Time Equivalent (FTE) occupants.
			1	SSc4.3 Low-Emission & Fuel-Efficient Vehicles: Provide low-emitting and fuel-efficient vehicles for 3% of FTE occupants and provide preferred parking for these vehicles OR provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total vehicle parking capacity of the site OR install alternative-fuel refueling stations for 3% of the total vehicle parking capacity of the site.
1				SSc4.4 Parking Capacity: Size parking to meet, but not exceed, minimum local zoning requirements, and, provide preferred parking for carpools or vanpools for 5% of the total parking spaces OR for projects that provide parking for less than 5% of FTE occupants, provide preferred parking for carpools or vanpools for 5% of the total provided parking spaces OR provide no new parking.
			1	SSc5.1 Protect or Restore Habitat: On a previously developed site, restore a minimum of 50% of the site area (excluding the building footprint) with native/adaptive vegetation. If pursuing SSc2, vegetated roof surfaces can be applied to the 50% requirement if the plants are native/adapted.
			1	SSc5.2 Maximize Open Space: Reduce the development footprint and/or provide vegetated open space within the project boundary to exceed the local zoning's open space requirement for the site by 25% OR if there is no requirement for open space (zero), provide vegetated open space equal to 20% of the project's site area. If pursuing SSc2, vegetated roof areas can contribute to credit compliance.
	1			SSc6.1 Stormwater Design, Quantity Control: If the site pre-development imperviousness is less than or equal to 50%, design for no increase in rate and quantity of stormwater runoff from pre-development to post-development conditions for the one- and two-year, 24-hour design storms OR if the site predevelopment imperviousness is greater than 50%, design for a 25% decrease in the volume of stormwater run-off from the two-year, 24-hour design storm.
1				SSc6.2 Stormwater Design, Quality Control: Reduce impervious cover, promote infiltration and capture and treat the stormwater runoff from at least 90% of the average annual rainfall using acceptable best management practices. Stormwater control measures that discharge off-site must remove 80% of the average annual post development total suspended solids (TSS) load.
1				SSc7.1 Heat Island Effect, Non-Roof: Provide shade (within 5 years) and/or use highly reflective paving materials (SRI at least 29) and/or use open grid pavement for at least 50% of site hardscaping (excluding the building footprint) OR place a minimum of 50% of the parking spaces under cover.
	1			SSc7.2 Heat Island Effect, Roof: Use roofing material having a high Solar Reflectance Index (SRI) equal to or greater than 78 for a low-sloped roof or 29 for a steep-sloped for a minimum of 75% of roof area OR install a vegetated roof for a minimum of 50% of roof area. Combinations of these two measures can also be applied.
1				SSc8 Light Pollution Reduction: Design exterior lighting for safety and comfort while not exceeding 80% of the lighting power densities for exterior areas and 50% for building facades and landscape features as defined in ASHRAE/IESNA Standard 90.1-2004 while following lighting zone (LZ3) requirements. The maximum candela of interior lighting shall fall within the building OR interior lighting shall be automatically turned off during non-business hours.

5	0	0	0	Water Efficiency
2				WEc1 Water Efficient Landscaping: Reduce potable water consumption for irrigation by 50% (1 point) or 100% (2 points) relative to baseline by using efficient irrigation technologies, captured rain or recycled site water OR design the landscape so that a permanent irrigation system is not required.
1				WEc2 Innovative Wastewater Technologies: Reduce usage of potable water for sewage conveyance by 50% OR treat 50% of wastewater on-site to tertiary standards.
2				WEc3 Water Use Reduction: Reduce potable water use by 20% (1 point) or 30% (2 points) relative to the baseline calculated for the building (not including irrigation) by meeting specified fixture flow requirements.

9	0	2	6	Energy & Atmosphere
■				EAp1 Fundamental Commissioning: Engage a commissioning authority (CxA) to design, implement and document a commissioning plan and complete a commissioning report. For projects less than 50,000 ft ² , the CxA may be a qualified staff member of the Owner, an Owner's consultant, or an individual on the design or construction team, and may have additional project responsibilities beyond leading the commissioning services.
■				EAp2 Minimum Energy Performance: Reduce the design energy consumption to comply with the mandatory provisions and prescriptive or performance requirements of ASHRAE/IESNA Standard 90.1-2004.

▪				EAp3 Fundamental Refrigerant Management: Use no CFC-based refrigerants in HVAC&R equipment and fire suppression systems.
7			3	EAc1 Optimize Energy Performance: Reduce design energy costs by 10.5-42% compared to the baseline building performance of ASHRAE/IESNA 90.1-2004 (worth up to 10 points depending on performance achieved).
			3	EAc2 On-Site Renewable Energy: Supply 2.5% (1 point), 7.5% (2 points) or 12.5% (3 points) of total annual energy use, by cost (regulated loads only), from on-site renewable energy sources.
		1		EAc3 Enhanced Commissioning: Engage an independent commissioning authority (from a third party firm) to design, implement and document a commissioning plan, provide peer review of design and construction documents, and carry out additional tasks as specified.
1				EAc4 Enhanced Refrigerant Management: Do not use refrigerants OR select refrigerants that minimize or eliminate the emission compounds that contribute to ozone depletion and global warming. Do not install fire suppression systems that contain CFCs, HCFCs, or Halons.
1				EAc5 Measurement & Verification: Develop a long-term continuous performance measurement and verification plan, for loads and efficiencies of basic building systems, that follows IPMVP requirements (see Reference Manual). The M&V period shall cover a period of no less than one year of post-construction occupancy.
		1		EAc6 Green Power: Engage in a minimum two year contract to purchase electricity certified (Green-e) by a green power producer for a minimum of 35% of the electricity consumed by the building.

5	2	0	6	Materials & Resources
▪				MRp1 Storage & Collection Recyclables: Provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling, including (at a minimum): paper, corrugated cardboard, glass, plastics, and metals.
			3	MRc1 Building Reuse: Maintain 75% (1 point) or 95% (2 points) of existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding windows and non-structural roofing materials). Maintain 50% of non-structural elements (interior walls, doors, floor coverings and ceiling systems) (1 additional point).
2				MRc2 Construction Waste Management: Develop and implement a waste management plan. Divert a minimum of 50% (1 point) or 75% (2 points) of construction, demolition and land-clearing waste from the landfill by recycling/salvaging materials (by weight or volume).
			2	MRc3 Materials Reuse: Use salvaged, refurbished or reused materials for at least 5% (1 point), or 10% (2 points), of all building materials (by cost), excluding mechanical, electrical, plumbing and specialty components.
1	1			MRc4 Recycled Content Materials: Specify that 10% (1 point) or 20% (2 points) of building materials (by cost) contain recycled content (full cost for post-consumer, half cost for pre-consumer).
1	1			MRc5 Regional Materials: Specify that 10% (1 point) or 20% (2 points) of building materials and products (by cost) be extracted, processed and manufactured within 500 miles of the project site.
			1	MRc6 Rapidly Renewable Materials: Specify that 2.5% of building materials (by cost) be manufactured using rapidly renewable materials (i.e. materials that renew fully within 10 years or less).
1				MRc7 Certified Wood: Specify that 50%, by cost, of all wood-based materials permanently installed in the project be FSC certified.

9	3	1	2	Indoor Environmental Quality
▪				EQp1 Minimum IAQ Performance: Comply with ASHRAE 62-2004 "Ventilation for Acceptable Indoor Air Quality" (sections 4 through 7). Mechanical systems shall be designed using the Ventilation Rate Procedure, or the applicable local code, whichever is more stringent.
▪				EQp2 Environmental Tobacco Smoke Control: Prohibit smoking in the building OR establish negative pressure (average 5Pa) in rooms with smoking (as specified) AND in both cases designate outside smoking areas to be at least 25 ft. away from entrance areas and air intakes.
1				EQc1 Outdoor Air Delivery Monitoring: Install permanent monitoring systems that provide feedback on ventilation performance. Generate an alarm when conditions vary by 10% or more from setpoint. For mechanically ventilated spaces, monitor CO2 concentrations within all densely occupied spaces (25 people per 1000 ft2) and provide a direct outdoor airflow measurement for systems serving non-densely occupied spaces.
			1	EQc2 Increased Ventilation: For mechanically ventilated spaces, increase breathing zone ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2004.
1				EQc3.1 Construction IAQ, During Construction: Design and implement an IAQ Management Plan to SMACNA standards. Protect building materials and ductwork from contamination. If air handlers are used during construction, install MERV 8 filters at each return air grille. Make provisions for inspection and correction of deficiencies that could adversely affect IAQ.
1				EQc3.2 Construction IAQ, Before Occupancy: Provide a building flush-out at 100% outdoor air according to LEED® requirements (before or overlapping with occupancy), OR, conduct baseline IAQ testing prior to occupancy (but after construction is complete).
1				EQc4.1 Low-Emitting Materials, Adhesives & Sealants: All adhesives, sealants and sealant primers installed within the weatherproofing system must have VOC contents below the limits specified in SCAQMD rule #1168. VOC contents for aerosol adhesives must be below the limits established by Green Seal Standard GS-36.
1				EQc4.2 Low-Emitting Materials, Paints & Coatings: All architectural paints, coatings and primers must have VOC contents below the specified limits of Green Seal Standard GS-11. All anti-corrosive and anti-rust paints must have VOC contents below the limits established by Green Seal Standard GC-03. All other paints and coatings must have VOC limits that are below the limits specified in SCAQMD Rule #1113. Requirements apply to products applied on-site and within the weatherproofing system.
1				EQc4.3 Low-Emitting Materials, Carpets Systems: All carpet shall meet the requirements of the Carpet and Rug Institute's (CRI's) Green Label Plus Program. All carpet cushion must meet the requirements of CRI's Green Label program. All carpet adhesive shall meet the requirements of credit EQc4.1 (50 g/L).
	1			EQc4.4 Low-Emitting Materials, Composite Wood & Agrifibre Products: Composite wood and agrifiber products used on the interior of the building must not contain added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied assemblies shall not contain added urea-formaldehyde.
	1			EQc5 Indoor Chemical & Pollutant Source Control: Design to minimize chemical pollution cross-contamination of regularly occupied areas including housekeeping areas.
		1		EQc6.1 Controllability of Systems, Lighting: Provide individual lighting controls for 90% of the building occupants to enable adjustments to suit individual tasks AND provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs.

			1	EQc6.2 Controllability of Systems, Thermal Comfort: Provide individual comfort controls for 50% of the occupants. Operable windows can be used in lieu of comfort controls for areas within 20 ft. inside of and 10 ft. to either side of the operable portion of the window. In both cases provide comfort system controls for all shared multi-occupant spaces.
1				EQc7.1 Thermal Comfort, Design: Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy.
1				EQc7.2 Thermal Comfort, Verification: Agree to implement a thermal comfort survey of building occupants within a period of 6 to 18 months after occupancy AND agree to develop a plan for corrective action if more than 20% of occupants are dissatisfied with thermal comfort in the building.
	1			EQc8.1 Daylight 75% of Spaces: Provide a minimum glazing factor of 2%, or at least 25 footcandles, in 75% of regularly occupied spaces. Compliance can be shown using glazing calculations, daylight simulation models or actual daylight measurements.
1				EQc8.2 Views for 90% of Spaces: Provide a direct line of sight to vision glazing (between 2'-6" and 7'-6" AFF) for 90% of all regularly occupied areas.

3	2	0	0	Innovation & Design Process
1				IDc1 Water Efficiency Exceptional Performance: Reduce usage of potable water for sewage conveyance by 100%, OR reduce potable water use by 40% relative to the baseline calculated for the building (not including irrigation).
1				IDc1 New Innovation Credit:
	1			IDc1 New Innovation Credit:
	1			IDc1 New Innovation Credit:
1				IDc2 LEED® Accredited Professional: At least one principal participant on the project team must be a LEED® Accredited Professional.

** This scorecard is intended to serve as a benchmarking tool to assess potential LEED-NC v2.2 performance. It does not confirm a LEED rating nor guarantee credit compliance. This document is the sole property of Enermodal and is only to be used for the project listed above. This document is not to be used in any other capacity without the expressed consent of Enermodal Engineering.*

APPENDIX B:
ENERGY EFFICIENCY RECOMMENDATIONS
FOR NORTHAMPTON POLICE DEPARTMENT

**ENERGY EFFICIENCY
RECOMMENDATIONS FOR:**

**NORTHAMPTON POLICE
DEPARTMENT**

NORTHAMPTON, MASSACHUSETTS

MARCH 2008

Prepared by:

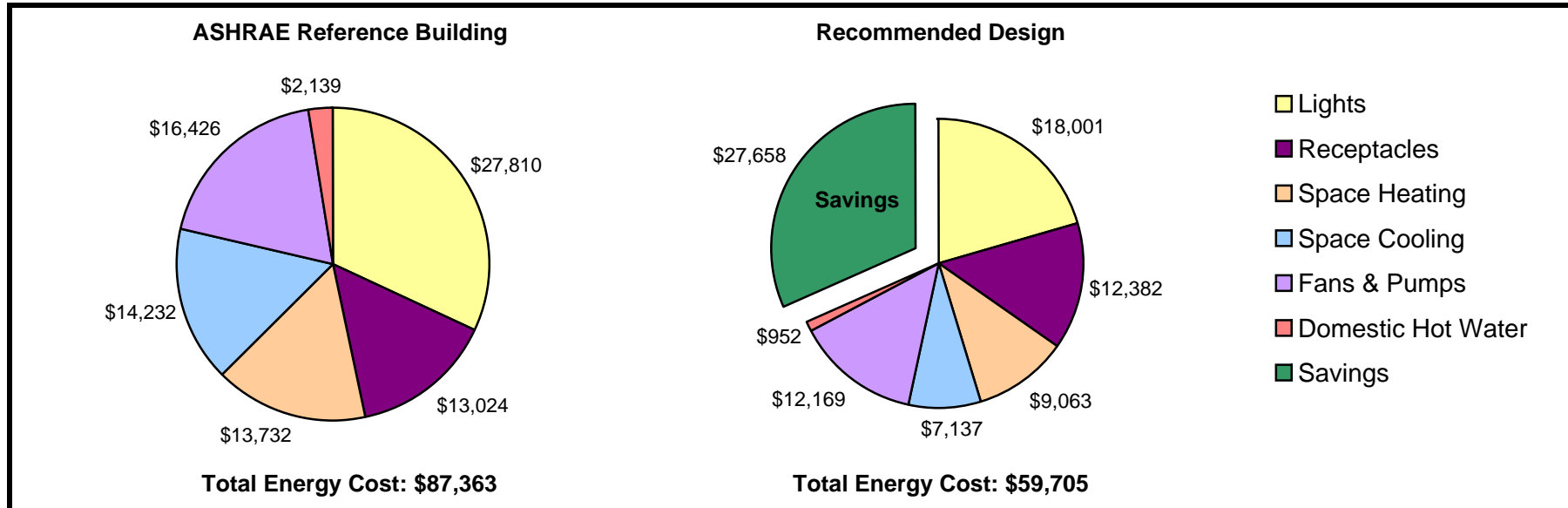
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NORTHAMPTON POLICE DEPARTMENT

SUMMARY OF RESULTS

Scenario	Peak Loads			Performance			Annual Energy Costs		
	Cooling Tons	Heating MBH	Electric kW	Total Energy kWh/m ²	LEED % Cost Savings	LEED EAc1 Points	Electricity Cost	Natural Gas Cost	Total Energy Cost
Baseline Design	167.7	1,176	200	278.5	2.9%	0	\$ 70,020	\$ 15,168	\$ 85,188
Recommended Design	110.9	1,097	109	192.8	37.2%	8	\$ 49,608	\$ 10,097	\$ 59,705

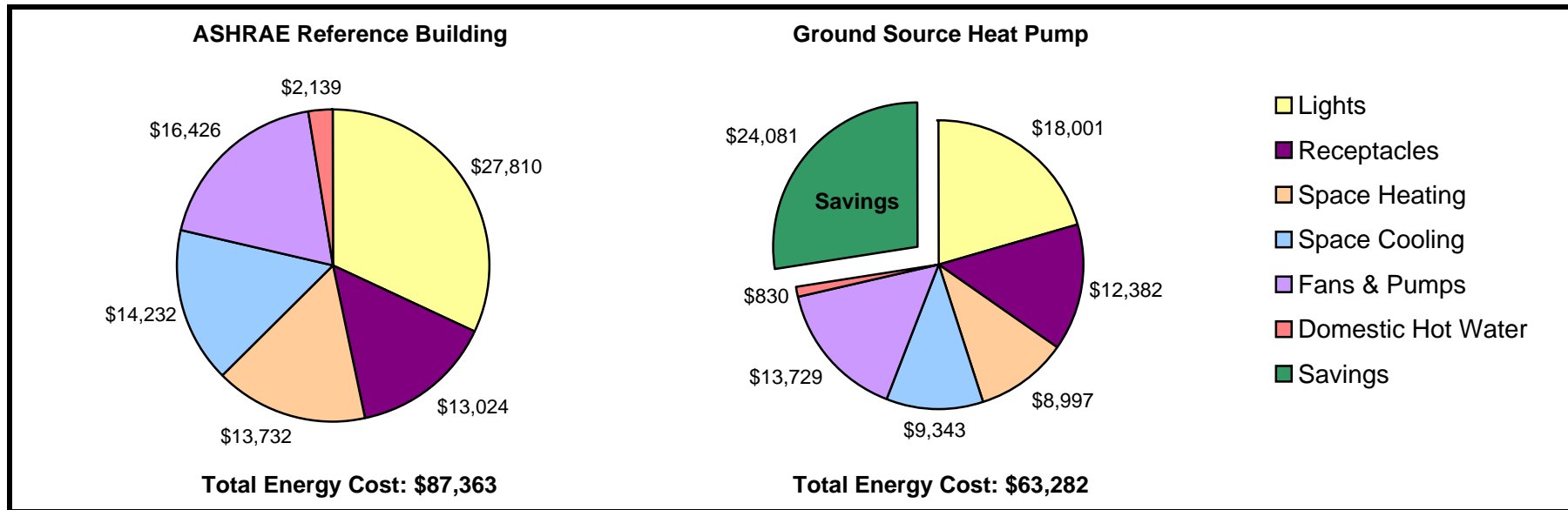


Scenario	Comparison to 'Baseline Design'				
	Annual Energy Cost Savings	Capital Cost	HVAC Cost Savings	Net Incremental Capital Cost	Payback Period (years)
Recommended Design	\$25,483	\$201,106	\$90,367	\$110,739	4.3

NORTHAMPTON POLICE DEPARTMENT

SUMMARY OF RESULTS - GSHP

Scenario	Peak Loads			Performance			Annual Energy Costs		
	Cooling Tons	Heating MBH	Electric kW	Total Energy kWh/m ²	LEED % Cost Savings	LEED EAc1 Points	Electricity Cost	Natural Gas Cost	Total Energy Cost
Baseline Design	167.7	1,176	200	278.5	2.9%	0	\$ 70,020	\$ 15,168	\$ 85,188
Recommended Design	110.9	1,097	109	192.8	37.2%	8	\$ 49,608	\$ 10,097	\$ 59,705
Ground Source Heat Pump	110.9	1,097	129	137.6	32.4%	7	\$ 62,452	\$ 830	\$ 63,282



Scenario	Comparison to 'Baseline Design'				
	Annual Energy Cost Savings	Capital Cost	HVAC Cost Savings	Net Incremental Capital Cost	Payback Period (years)
Recommended Design	\$25,483	\$201,106	\$90,367	\$110,739	4.3
Ground Source Heat Pump	\$21,906	\$332,705	\$138,627	\$194,078	8.9

Capital Cost Assumptions: Incremental cost of ground source heat pump system is \$3000/ton.
HVAC Cost Savings Assumptions: \$1200/ton savings for eliminating boiler and chiller plant.